When the bending plate is moved laterally with respect to the top surface, the ends of the contact members are moved into contact with the [ball terminals] terminal balls. The ends of the contact members are urged into contact with the [ball terminals] terminal balls between the center of the [ball] terminal ball and the surface of the ball grid array device, thus retaining the device in the socket.

In the Specification

Please amend the paragraph which begins at Col. 1, Line 40 and ends at Col. 2, Line 5 as follows:

While the term "ball grid array device" is usually applied to a device package which has substantially spherical contacts extending from one face thereof, the term is also applied to other structures. For example, bare (unencapsulated) chips are sometimes provided with a grid array of ball-shaped contacts for mounting in a package. However, at some point during fabrication, the bare chip with ball-shaped contacts is fairly described as a ball grid array device. Similarly, finished chips are sometimes provided with terminal pads on one surface with ball-like deposits of solder forming interconnections on the terminal pads. The chip is then inverted and attached directly to a corresponding pattern of interconnect pads on a substrate. When heated, the solder balls reflow forming electrical and physical connections. This process (sometimes referred to as "flip-chip" technology) obviously uses devices which may be described as ball grid array devices. Accordingly, for purposes of this disclosure the terms "ball grid array" and "ball grid array device" mean any structure, including device packages, flip chips and bare dies, carrying a plurality of substantially ball-shaped interconnections on one face thereof which are arranged in a substantially grid-like pattern. The ball terminals are substantially spherical and are arranged on one face of the device package in a predetermined pattern. Since the ball

terminals are substantially spherical and uniform in size, each ball terminal has a geometric center which is spaced from the surface of the device package from which the ball terminal depends and the geometric centers of the ball terminals lie substantially in a plane parallel with the surface of the device package from which the [ball terminals] terminal balls depend. This plane (or the corresponding plane for each individual [ball] terminal ball) is referred to herein as the center, centerline or extended centerline of the [ball] terminal ball.

Please amend the paragraph which begins at Col.2, Line 6 and ends at Col. 2, Line 23 as follows:

Many electronic devices are subjected to testing and burn-in at some point during or after the fabrication process. For burn-in and testing, the device must be removeably mounted on a test fixture which provides electrical connection with each of the input/output terminals while the device is functionally tested and evaluated. In many cases the device is subjected to harsh environmental conditions (such as heat, etc.)as well as electrical stresses to evaluate and assure full functionality of the finished device. In order to provide for effective testing and burn-in, the fixture in which the device is mounted for testing and burn-in must permit rapid and easy insertion and removal without damage to the device, the device package or the delicate [ball terminals] terminal balls. However, the very features of the ball grid array device which make it attractive as a device structure (i.e., closely grouped very small contacts arranged on a hidden face) make it extremely difficult to reliably mount in a test socket without damaging the device structure.

Please amend the paragraph which begins at Col. 2, Line 50 and ends at Col. 3, Line 32 as follows:

The socket or mounting [housing] housings of the invention [comprises a support member having a top face with a plurality of] include support members with windows arranged therein to receive the array of interconnection terminal balls depending from the face of a ball grid array package. The socket also includes a base member in which a plurality of axially elongated contact pins or fingers are anchored. One end of each contact finger extends through the base to provide an attachment tail which may be soldered to a burn-in board or the like. The opposite end of each finger projects into one of the windows. The central portion of each finger (between the free end and the base) extends through an aperture in a bending plate mounted between the base and the support member. The bending plate may be fixed or moveable laterally with respect to the support member to move the free ends of the contact fingers with respect to the windows. The end portion of each free end is curved or bent to define a contact tip at the extreme end of the free end which deviates from the axis of the finger. The fingers are mounted so that in the open configuration the free end portions of the contact fingers [are adjacent one side of their respective windows] extend into a window. When a ball grid array device is positioned on the top face of the support member, the terminal balls project or depend into the windows. In the preferred embodiment, a cam is used to move the bending plate laterally, thus simultaneously and uniformly moving the free ends of all the contact fingers in the same direction. The end portions are thus urged into contact with the terminal balls occupying the windows. The extreme portion of each finger (which is deviated from the axis of the finger) is positioned adjacent the top of the window. Thus, when the finger is moved by the bending plate, the end contacts the terminal ball above the horizontal centerline thereof. The fingers thus provide individual

electrical contact to each ball and, since they contact the balls above their centerlines (between the center of each ball and the device face from which it depends), they retain the balls in [their respective windows] the window and thus entrap the ball grid array device. Since the ball grid array device is held in place by the end portions which contact the balls above their centerlines, the size of the balls may vary within limits without affecting the trapping effect of the contact fingers. Because of the simplicity of design and operation, the socket devices of the invention may be made from a wide variety of available materials. Since the top of the socket is open, automated processes may be employed to load and unload the socket without damage to the devices or the sockets and the top surface of the device is exposed for cooling and/or attachment of a heat sink. Other features and advantages of the invention will become more readily understood from the following detailed description taken in connection with the appended claims and attached drawing in which:

Please amend the paragraph which begins at Col. 4, Line 18 and ends at Col. 4, Line 35 as follows:

Terminal balls 12 are arranged on the lower face of ball grid array device 10 in a predetermined grid-like pattern. To accommodate the ball grid array device, the mounting housing of the invention employs a top support member 22 which has a plurality of windows 23 extending therethrough (see FIG. 1A). [The] As shown in FIG. 1A the windows 23 are arranged in a grid pattern matching the grid pattern of the [ball terminals] terminal balls 12. As shown in FIG.S 2, 3, 6 and 7 top support member 22 defines a single window into which all the terminal balls depend and into which the contact fingers extend with their ends arranged in a grid pattern matching the grid pattern of the terminal balls 12. To accommodate ball grid array devices of

different dimensions, the top face 24 of support member 22 may be provided with removeable spacers 35 of various sizes. The spacers 35 define the periphery of each particular ball grid array device and position the ball grid array device to prevent movement thereof laterally with respect to top face 24. Spacers 35 therefore assure that each ball grid array is aligned with the [ball terminals] terminal balls 12 depending from the lower face 11 thereof in proper registry and orientation with windows 23 and may be changed as required for each size and shape of ball grid array device package.

Please amend the paragraph which begins at Col. 4, Line 36 and ends at Col. 4, Line 61 as follows:

In the [preferred] embodiment illustrated in FIG. 1 the socket of the invention is formed of a plurality of plate-like components (described in detail hereinafter) contained within a unitary box-like housing 100 having an open top and open bottom. As illustrated in the embodiment of FIGS. 2, 3 and 4 the housing contains a base member 21 which has a plurality of apertures 30 therein positioned substantially in registry with windows 23 in support member 22. Each aperture 30 has an internal shoulder 31 (see FIG. 4). An elongated contact finger 40 is positioned in each aperture 30. In the preferred embodiment, each elongated contact finger defines an axially elongated body of resilient electrically conductive material such as nickel-coated steel or the like. The mid-section 43 of each contact finger 40 is substantially widened to form shoulders 45 and 46 on opposite ends thereof. Accordingly, when contact fingers 40 are inserted in the base member 21, tail portions 41 project through apertures 30 and shoulders 46 rest on shoulders 31. Trap plate 25 having apertures 32 and shoulders 33 in registry with and corresponding to apertures 30 is secured to base member 21 and shoulders 33. The upper portion

44 of each contact finger 40 extends through an aperture 32 and the shoulders 33 on aperture 32 contact shoulders 45 on the expanded mid-sections 44 of the contact fingers. Accordingly, the contact fingers 40 are securely entrapped and held in place in the base member 21 by trap plate 25.

Please amend the paragraph which begins at Col. 5, Line 1 and ends at Col. 5, Line 15 as follows:

The upper portion 44 of each contact finger 40 which extends above the mid-section 43 projects through an aperture 54 in bending plate 28 with its free end 42 terminating in window 23. In the preferred embodiment, the free end portion 42 of each finger 40 is sufficiently elongated to define a generally central axis which is substantially perpendicular to the support surface 24 and extends into [a] window 23. The extreme end 42a, however, is bent or curved to deviate from the central axis and extends into the window 23 toward the support surface 24 but does not extend through the window 23 or surface 24. For best results, the extreme end 42a should extend as near the surface 24 as possible without extending therethrough. It is only necessary, however, that the extreme end 42a be above the centerline of the ball terminal which it contacts.

Please amend the paragraph which begins at Col. 5, Line 16 and ends at Col. 5, Line 25 as follows:

In the [preferred] embodiment of FIG. 1A each window 23 has a small recess 23a which accommodates the end portion 42 of contact finger 40. As illustrated in FIGS. 2, 3 and 4

bending plate 28 is positioned between trap plate 25 and support member 22 but is free for reciprocal movement laterally with respect to the housing. Since mid-sections 43 of contact fingers 40 are securely anchored between the base member 21 and trap plate 25, lateral movement of bending plate 28 causes corresponding lateral movement of the free end portions 42 of contact fingers 40.

Please amend the paragraph which begins at Col. 5, Line 47 and ends at Col. 6, Line 2 as follows:

The position of the upper portions 44 of contact fingers 42 in the housing in the open condition is illustrated in FIG. 2. In this position the contact fingers 40 are either relaxed or forced into the open position by bending plate 28. If desired, a spring (not shown) may be positioned between the housing 100 and the end of the plate 28 opposite end 29 to ensure that the free end portions 42 are withdrawn into recesses 23a. Accordingly, a ball grid array device may be positioned with the [ball terminals] terminal balls 12 depending into windows 23 by simply positioning the ball grid array in the proper position. Since the free end portions 42 are withdrawn into recesses 23a, the [ball terminals] terminal balls 12 simply depend into window[s] 23. Thus, no pressure of any sort is applied to any portion of the ball grid array device 10 or the depending [ball terminals] terminal balls 12. Furthermore, no force is applied (other than gravitational) to any portion of the socket by the electronic device package or the [ball terminals] terminal balls. When the ball grid array device is securely in place, lever 52 is moved to rotate cam 50 and urge lobe 51 into contact with the end surface 29 of bending plate 28. As plate 28 is moved (to the left as shown in FIG. 2) by lobe 51, the free end portions 42 of the contact fingers 40 uniformly and simultaneously move toward and into contact with the [ball terminals] terminal

balls 12 depending into the windows 23.

Please amend the paragraph which begins at Col. 6, Line 3 and ends at Col. 6, Line 31 as follows:

As best shown in FIG. 1A and graphically illustrated in FIG. 5, the free end portions 42 of contact fingers 40 are positioned to extend into windows 23 near surface 24 but do not extend above surface 24. Furthermore, the free end portions 42 are bent so that the extreme end 42a deviates from the vertical axis of the pin 40 toward the [ball] terminal ball 12 to form a cup or hook at the extreme end 42a of the contact finger 40. As illustrated in FIG. 5, the extreme end 42a of free end portion 42 must extend above the centerline of the [ball] terminal ball 12. For representative purposes, FIG. 5 illustrates the relative position of extreme end 42a in contact with a [ball] terminal ball when the nominal ball size is 0.030 inch. Nominal ball sizes of 0.030 inch may vary from about 0.035 to about 0.024 inch in diameter. Thus the point of contact on the ball may vary slightly with variations in ball size. However, as shown in FIG. 5, where the extreme end 42a of free end portion 42 extends at least 0.001 to about 0.002 inch above the extended centerline (the horizontal line passing through the center of the [ball] terminal ball 12), the point of contact between the extreme end 42a of contact finger 40 will be approximately five degrees (5.degree.) above the extended centerline of the [ball] terminal ball 12. Thus, since the ball grid array device 10 is trapped and prevented from horizontal movement by spacers 35, pressure exerted against the [ball terminals] terminal balls 12 by extreme ends 42a of the contact fingers 40 have both a lateral force component and a small downward force component. The ball grid array device 10 is thus trapped and secured against the top face 24 of the support member 22 by the lateral and downward pressure exerted on the [ball terminals]

terminal balls 12 by contact fingers 40.

Please amend the paragraph which begins at Col. 6, Line 32 and ends at Col. 6, Line 49 as follows:

The relative positions of the [Components] components of the mounting housing and the ball grid array device when the housing is in the closed condition is illustrated in FIG. 3. Note that lobe 51 on cam 50 has forced plate 28 to the left as shown in FIG. 3. The extreme ends 42a of contact fingers 40 have moved in the same direction until they contact the surface of [ball terminals] terminal balls 12. As the bending plate 28 moves further to the left, the mid-section 44 of each contact finger 40 is bowed until a contact pressure of approximately thirty-five (35) grams is applied to each [ball] terminal ball. Since the extreme end 42a of the contact finger 40 is above the centerline of each of [ball] terminal ball 12, this pressure securely locks the entire ball grid array device adjacent the top surface 24 of the mounting housing and each contact finger 40 is in electrical contact with a [ball] terminal ball 12 for electrical function testing, etc. However, a pressure in the range of about thirty-five (35) grams is insufficient to damage or dislodge the ball terminals 12.

Please amend the paragraph which begins at Col. 6, Line 50 and ends at Col. 6, Line 61 as follows:

After testing, burn-in or other procedures have been applied to the ball grid array device 10, the device is released by merely moving lever 52 in the opposite direction, permitting the contact fingers 40 (and springs, if included) to urge plate 28 in the opposite direction and